REMARKS

Claims 1-48 and 97-135 are active in the present application. Claims 1-48, 97 and 98 stand withdrawn from consideration. Reconsideration is respectfully requested.

The present invention relates to a transfer belt that is used in various types of electrophotographic image forming apparatus.

Invention

The present invention as claimed in Claim 99 is directed to an intermediate image transfer belt for an image forming apparatus that comprises an image carrier for forming a latent image, a developing device for developing said latent image with a developer to thereby form a corresponding toner image and said intermediate image endless transfer belt to which said toner image is transferred from said image carrier, and executes primary image transfer from said image carrier to said intermediate image endless transfer belt and then executes secondary image transfer from said intermediate image endless transfer belt to a recording medium. The endless transfer belt is prepared by feeding a first raw liquid rubber material into a hollow, cylindrical mold, which is included in a centrifugal molding machine, with said mold being rotated, and then curing the first raw rubber material to thereby form a first outer belt layer on an inside of the mold. A second raw liquid resin material is fed into the mold with said mold being rotated, and then the second resin raw material is cured to thereby form a second inner belt layer. By this process the first outer belt layer has elasticity while the second inner belt layer has greater hardness than said first outer belt layer. Further, the first outer belt layer has a surface gloss of at least 50, a hardness ranging from 30° to 70°, as measured by JIS A scale, and a thickness of 200 to 2000 μm and the second inner belt layer has a thickness ranging from 30 to 1,000 μm and has a hardness greater than that of the first outer belt layer.

Prior Art Rejection

Claims 99-135 stand rejected based on 35 USC 103(a) as obvious over Tanaka et al, U.S. Patent 5,978,638. This ground of rejection is respectfully traversed.

It is noted that the Tanaka et al patent teaches an endless intermediate transfer belt which comprises an innermost layer (elastic layer 30) and an outer (covering) layer (31). Tanaka et al teaches that fibers or cloth is woven into the belt in the circumferential direction in order to reduce the expansion and contraction of the belt which is formed of rubber. The present inventors have experienced that in a machine containing such a belt that the fibers must be thick enough to provide the belt with sufficient strength and that, if the belt with such thick fibers is not of sufficient thickness itself, then fiber marks will appear in the image that is eventually formed when the belt is pressed against a paper sheet. Furthermore, because the usual fibers and cloths that are employed are not electrically conductive, the belt with the fibers or cloth woven therein does not have uniform electrical resistance with the result that the strength of an electrical field that acts on the toner, at the time of electrostatic image transfer, becomes uneven. Thus, the tendency exists to bring about an image transfer which is defective only at the portions of the image which correspond to the positions where fibers are present in the belt. Moreover, fibers or fabrics, in general, are formed by intertwisting extremely short filaments into fibers and then combining the fibers together. The filaments that are formed are twisted in a preselected direction. As a result, when a belt having such fibers is driven, the belts tends to move to one side in the widthwise direction. Consideration then must be given to the drive of the belt.

Upon consideration of the above aspects of belt construction applicants have invented a belt that has a multilayer of sufficient rigidity, In the present belt, the innermost layer of the belt is of uniformly increased rigidity to prevent the marks of fibers, which are locally distributed in the belt, from appearing in the image of the product at the time of image

transfer. The centrifugal method of forming the belt described in the text was the only method found that could satisfactorily form such a belt that has a sufficiently elastic surface layer, that is endless and whose layers satisfactorily adhere to each other. Other methods of belt preparation were unsatisfactory.

Turning now to Tanaka et al, the patent describes a belt, as shown in Figs 1 and 2, whose layered structure includes a resin layer (outer layer), that includes a resin layer, which is a specific form of surface layer, that has a greater hardness than the innermost layer. It should be noted that in a belt of bi-layer construction, the bi-layer structure regulates the center position of expansion and contraction at the time of bending with the innermost or rigid layer which is least stretchable. In the fibrous structure proposed by Tanaka et al, which is different from a belt of bi-layer structure, the fibers are usually located at the center position of the belt where they are surrounded by rubber. Therefore, when the belt is subjected to a bending force, rubber that is inward of the fibers and the rubber that is outward of the same contracts and expands outwardly, respectively, so that the load which acts on the belt is light. By contrast, when the innermost layer only stretches to a little extent and therefore does not expand or contract, the center of the bend is positioned at the innermost layer with the result that only the outer or elastic layer expands and is therefore subjected to a heavy load. It follows that the thickness of the outer layer must be selected carefully enough to obviate cracks and other defects. This is particularly true with the multilayer structure of the belt of the present invention.

Although the Tanaka et al patent discloses an endless intermediate transfer belt for an image forming apparatus, the basic bi-layer construction of the belt is not the same as the bi-layer belt of the present invention. In Tanaka et al, the bi-layer belt that is constructed is formed of a first rubber layer that is formed on the outside of a cylindrical mold (see Example 1 of the patent) which is then cured. Thereafter, a second (covering) layer of a resin is

formed on the cured rubber layer. By this construction, the endless belt that is formed and placed in the image forming apparatus is so configured that the outer belt layer that comes into contact with a transfer medium P (paper) is the resin layer of the belt. The first cured rubber layer of the belt is the inner layer which supports the outer resin layer and does not come into contact with the transfer medium P. In the present invention, on the other hand, the bi-layer construction of the claimed endless belt is opposite that of the reference. That is, in the construction of the belt of the present invention, rubber material is fed into a hollow, cylindrical mold, thereby forming a layer therein, which, when cured, forms a first outer layer of the belt that is formed. Thereafter, a resin is fed into the mold which results in the formation of a second layer of the belt, where the resin layer is the inner layer of the endless belt. Accordingly, when the belt of the invention is placed in position within an image recording apparatus, the outer cured rubber layer of the belt, not the inner resin layer, comes into contact with the image transfer medium onto which an image is transferred.

In discussing the belts of the present invention and that of Tanaka et al in paragraph 3 of the Office Action, the Examiner makes the comment on page 3 of the Action that "Tanaka et al uses the same second layer as Applicant." The meaning of this statement is not clear. It is clear that Tanaka et al in column 8 of the patent describes two embodiments of an endless belt. The first embodiment is a belt of bi-layer construction in which a covering layer 31 of a resin material is formed on an elastic layer 30 that is of less hardness than the covering layer. The covering layer is 200 μm or less while the thickness of the covering layer ranges from 300 μm to 3000 μm. The second embodiment of a belt that is described in column 8 is a belt of tri-layer construction in which an underlying or innermost elastic layer is covered with first and second covering layers, respectively. The first covering layer is made of a tacky material such as, foe example, a styrene-butadiene rubber, and the second, harder layer is formed of a resin. On the other hand, in the present invention, the belt that is claimed is of a bi-layer

construction of an underlying or innermost resin layer and an outer layer that is a rubbery or elastic material. No tri-layer belt construction is claimed in the present invention. A question that arises is to what layer of the present belt does the "second" layer of the belt of the patent correspond? It is abundantly clear from the discussion in column 8, lines 37-45 of the Tanaka et al patent that the outermost of the three layers or the "second" layer is formed of a resin, and therefore is comparatively hard, while the outermost layer of the bi-layer belt of the present invention is made of an elastic or rubbery material so that the layer has some deformability. Thus, the statement by the Examiner that the "Tanaka et al patent uses the same second layer as Applicant" does not appear to be accurate. In the case of the first embodiment of the belt of Tanaka et al, the outermost or covering layer 31 of the bi-layer belt is formed of a resin and therefore corresponds to the "second" layer of the tri-layer belt embodiment disclosed in the patent.

Applicants again emphasize that it is important in the present invention to fabricate a bi-layer belt where the outermost layer, that makes contact with paper during image transfer, be of a deformable or elastic material while the inner layer material which backs-up the outer elastic layer is of a harder resin. Such a configuration is not what the reference describes. Accordingly, the endless belt as claimed in the present invention is distinct from the belt of the reference and withdrawal of the obviousness ground of rejection is respectfully requested.

Applicants remain of the opinion that the application is in proper condition for allowance. Early notice to this effect is earnestly solicited.

Respectfully submitted,

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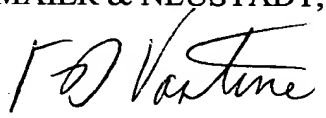

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